MET/CAL®
Calibration Software

MET/CAL and 5500/CAL
Sample Version 4.0

FLUKE®

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INTRODUCTION

FLUKE CALIBRATION SOFTWARE

Fluke calibration software is a powerful group of applications which automate the calibration of a wide range of electronic measurement equipment including meters and oscilloscopes. It brings the procedural, testing and reporting activities of individual calibrations under a single easy-to-use umbrella. Fluke is currently offering two versions of calibration software, MET/CAL® and 5500/CAL. Both packages offer improvements to your metrology operation.

- **Calibration and Administrative Productivity — Increased**
  Operators are guided through step-by-step procedures with detailed test results recorded. Calibration reports, test summaries and certificates can be printed automatically. More work gets done in less time.
- **Conformance to ISO 9000 and MIL-STD-45662A — Assured**
  MET/CAL and 5500/CAL are indispensable tools in helping you fulfill the traceability, procedure documentation, out-of-tolerance and record keeping requirements of these standards.
- **Consistency of Calibrations — Increased**
  Procedures are executed exactly the same way each time, no matter how many times you run them. Only one task is displayed at a time, eliminating the possibility of skipping a step or failing to record the result of a test step as often happens with paper procedures.
- **Use of Personnel and Equipment — Improved**
  Explicit on-screen instructions and the consistency provided by the single-step-at-a-time philosophy allow you to

place inexperienced technicians at benches where only well-experienced technicians could work before, thereby freeing veterans for the really tough jobs.

- **Throughput and Turnaround Times — Reduced**
  Increased productivity and optimum use of personnel and equipment mean test units spend less time in the shop and more time in the hands of the owning organization.
- **Cost Control — Strengthened**
  MET/CAL and 5500/CAL help you eliminate unnecessary repeat calibrations, reduce individual calibration times, reduce the time for compiling data and reduce your through-put and turnaround times; all of which let you put the squeeze on costs.

What Is MET/CAL?

MET/CAL is Fluke's premium calibration software. It offers control drivers for a wide range of instrumentation, all under IEEE control. The new Fluke 5500A Multi-Product Calibrator is also supported. Operating under Microsoft® Windows®, four separate modules are included to provide:

- execution of calibration procedures.
- recording and printing of test result reports and calibration certificates.
- maintenance of traceability information.
- password security for all vital parts of the program.
- full procedure editing capability with on-line help.

What Is 5500/CAL?

5500/CAL is calibration software which is designed to exclusively operate Fluke's 5500A Multi-Product Calibrator and Model 45 DMM under serial control. It offers all of the automation benefits of MET/CAL in a value package. When running on a laptop computer, 5500/CAL coupled with a 5500A calibrator, and optionally a 45 DMM, make an ideal portable calibration system. Since no IEEE interface is required, no additional expansion slots in a cramped laptop computer are needed.

THE MET/CAL SAMPLE VERSION

The MET/CAL Sample Version serves two purposes. First, it is used as a demonstration of MET/CAL to potential new customers. A review of the exercises presented will acquaint you with the benefits MET/CAL has to offer. Second, it provides a brief overview of MET/CAL for a new user. Completion of the exercises will get you off to a fast start.

Accompanying this booklet are disks containing a complete copy of the MET/CAL Sample Version. The Sample Version differs from the full version of MET/CAL in only one way: its procedures are limited to a maximum length of 40 lines, while the full version can handle up to 4000-line procedures.

Since the functionality of MET/CAL and 5500/CAL are the same – except for instrument drivers – there is no separate sample for 5500/CAL. The examples and exercises provided in this booklet will apply to both products.

You can be up and running on MET/CAL very quickly by doing the exercises in the Calibration Overview. Loading the Sample Version of MET/CAL and completing the Calibration Overview takes less than an hour.

System Requirements

In order to run the MET/CAL Sample Version, your personal computer's configuration must match the minimum configuration listed in the table below. For the best performance, install MET/CAL on a computer that matches the "Recommended Configuration."

	Minimum Configuration	Recommended Configuration
Computer	80386 Based Personal Computer	80486 PC
Memory	4 MB RAM	8 MB RAM
Storage	6 MB Free Hard Disk Space	10 MB Free Hard Disk Space
I/O	1 Free Serial Port[1] up to 2 IEEE-488 Ports[2]	1 Microsoft Compatible Mouse 1 Free Serial Port[1] up to 2 IEEE-488 Ports[2]
Video	VGA	SVGA
Operating	DOS 3.3 or higher Microsoft Windows 3.1 or higher	DOS 3.3 or higher Microsoft Windows 3.1 or higher

[1] A free serial port is only required if you intend to operate a Fluke 5500A in "Live" mode. The exercises in this booklet do not require a serial port to be available.

[2] IEEE ports are only required if you intend to operate an IEEE controlled calibrator – like a 5100B or 5700A – in "Live" mode. The exercises in this booklet do not require IEEE ports to be installed.

How This Booklet is Organized

This booklet is divided into four sections, Introduction, Calibration Overview, Administrator Options and Creating Calibration Procedures. Included in this Introduction is important information about loading and using the Sample Version of MET/CAL.

The Calibration Overview contains a few pages of simple exercises that take you step-by-step through the calibration features of the MET/CAL program. Administrator Options explains how to customize the way MET/CAL operates for your installation. Creating Calibration Procedures provides a look at MET/CAL's procedure editor and explains how to create and test procedures. Each group of exercises is designed around a specific set of MET/CAL functions, oriented towards a different metrology need.

Anyone who completes the exercises in this booklet will quickly see how the power and flexibility of well-designed metrology software can make any metrology organization easier to run, more productive and much more efficient.

Everything you need to run the MET/CAL Sample Version is provided in the program software, including a set of sample procedures. With them you will soon learn how quickly you can put MET/CAL to work, and see how easy it will be to tailor MET/CAL to your needs. Because the sample is preconfigured to operate in Demo Mode, no IEEE interfaces are required to get started.

GETTING STARTED WITH MET/CAL

Loading the Sample Software

The MET/CAL Sample Version, freshly installed, takes up almost 5 MB of disk space. It must be installed onto your hard disk to use it. An uninstall program is provided which will completely remove the Sample Version from your hard drive. In order for the uninstall to function satisfactorily and to avoid conflicts with the real version of MET/CAL, you should not modify the default file structure provided by the install program. To install the MET/CAL Sample Version:

1. Turn your computer on and allow it to boot up normally.
2. Start your Windows system.
3. Place the Sample Version disk 1 into your computer's 3.5" disk drive, Drive A: or B:.
4. From the Windows Program Manager, select File from the top menu bar.
5. Choose the Run... option from the pull down menu.
6. Type **a:setup** in the command line field of the Run dialog box. Substitute **b:** if you are using drive B to load the sample software.
7. Click on OK.
8. Follow the installation instructions on the screen.

The MET/CAL Sample Version will install and initiate a new program group in the Windows Program Manager. You should see a new program group similar to Figure 1.

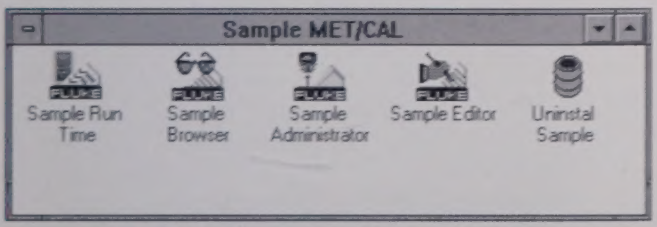


Figure 1. MET/CAL program group.

Overview of MET/CAL Modules

MET/CAL's functionality is divided among four separate modules:

Run Time
The Run Time module is used to execute calibration procedures. This is the module that a system operator will become most familiar with. It controls the calibration standards used in the system via an IEEE interface or it can control the Fluke 5500A and 45 DMM on your computer's serial port. After procedure execution, the Run Time module can save test results and print reports.

Editor
The Editor module is a special purpose cal procedure editor which assists in creating error free calibration procedures. It includes a MET/CAL specific compiler which prepares completed procedures for executing in the Run Time module. In addition, test run and special debug features are included to get procedures written and tested quickly.

Administrator
The Administrator module has several purposes in controlling MET/CAL. Access to the Administrator module is limited by login and password to secure vital MET/CAL operating files (see Access Level Passwords below). All the system calibration standard's traceability is maintained through this module. User passwords and access levels are controlled here also.

Browser
The Browser module is provided for read and print access only to Calibration Procedures and Test Result files. No data can be modified by using the Browser application. No login security is enforced to use the Browser.

Running the Sample Software

To assist new users who may already have a copy of real MET/CAL loaded on their computer, the Sample Version is installed in a separate directory structure from the real MET/CAL. This allows both versions of MET/CAL program files to reside on your hard disk without any risk of changes in one affecting the other. Because of this, you may freely use the Sample Version for experimentation. Explore all of the

options available in MET/CAL, make changes to format and configuration files without worry that you will cause any problems with the real MET/CAL. You cannot, however, run both versions (real and sample) concurrently.

ENTERING DATA IN MET/CAL

MET/CAL follows normal Windows conventions for entering data wherever possible. If you are new to the Windows environment, you should read your Windows documentation to learn these conventions. A normal Windows installation provides a Help selection in the Program Manager. Under the Help system you will find a Windows Tutorial which provides information about a typical Windows screen and using the mouse to navigate. You should refer to these resources any time you have questions about using Windows applications.

Entering Data

As you follow the instructions in the exercises, you will see words and letters which are printed in a keycaps font or **boldface**. These are things you must type in from the keyboard.

Words or letters in keycaps represent a keyboard key you must press. For example F2 means press the F2 key on the keyboard. Shift F9 means hold down the shift key while you press the F9 key.

Boldface words and letters you type as they appear. Either upper or lower case is fine. If you read

Press Enter and type **metcal.ini** Enter you need to press the Enter (or Return) key on your keyboard, type in the file name metcal.ini, followed by the enter key.

Sometimes you will be prompted to enter text into a blank field. After you have typed in the required data, you will typically use the mouse to select an OK button. If there is more than one field available for data entry, you should use the Tab key to advance to the next entry point.

When "menu bars" and "pull down" menus are presented, you may make your selection by positioning the pointer on your choice and pressing the left mouse button. Alternatively, if there is an underlined letter within the option you want to select then you may hold down the Alt key and press the indicated letter key simultaneously.

ACCESS LEVEL PASSWORDS

There are three levels of users in MET CAL, each offering different levels of access to the MET CAL programs. The system administrator has the highest access level and can establish a login, password and access level for every other user of the system. The levels and respective capabilities are specified in the table below.

Security Level	MET/CAL Module Access
Administrator	All
Procedure Writer	Editor, Run Time, Browser and parts of the Administrator
Operator	Run Time and Browser
(none)	Browser Only

In this Sample Version, an administrator name – fluke – and password – ok – have been pre-configured. By logging into the MET CAL modules with this name and password, you will have access to all of MET CAL's modules and capabilities

REMOVING THE SAMPLE SOFTWARE

The Sample Version contains an extra module – ***MET/CAL Uninstall*** – to automatically remove the sample files and directories. You can execute the uninstall program by double-clicking on the icon provided in the MET/CAL Sample program group. Doing so will remove all files, including any of your own experimental procedures, so please be sure you no longer need them before you remove the Sample Version.

GETTING HELP

If you are in the U.S. or Canada, you can get technical help by calling Fluke's MET/SUPPORT software support line at 1-800-825-7411. Be sure to explain that you are trying out the Sample Version of MET/CAL. In other countries, contact your local Fluke representative for technical assistance.

Anytime you wish your Sample Version of MET/CAL returned to its original as-shipped configuration, just remove and reload the software from the distribution disks as described above.

CALIBRATION OVERVIEW

This section will guide you through running a typical calibration procedure. The procedure you will be running is made up of short segments to demonstrate the key features that METCAL provides. It is not intended as a thorough calibration of the UUT.

PRELIMINARIES

Starting the Run Time Module

To execute a calibration procedure, you must start the Run Time module.

1. Double-click on the Run Time icon.

When the program has finished loading, you will see a login dialog box prompting you for your user name and password. Access to the Run Time module is limited to users who have the appropriate level of security as determined by the system administrator. In this sample session you can type **fluke** as the user name, tab to the password field and type **ok**, then press the OK button.

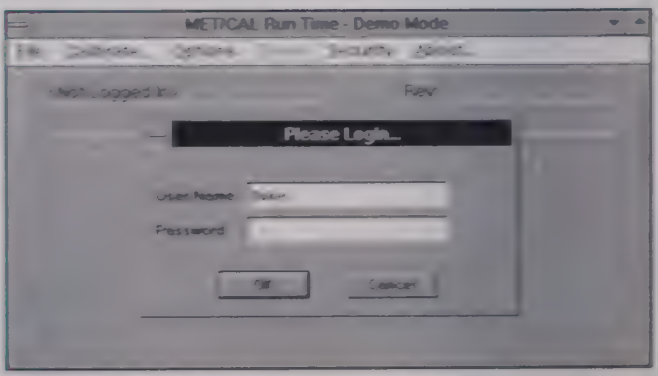


Figure 2. Login dialog box

The software is now ready to execute a calibration procedure. The sample version has been pre-configured to operate in Demo Mode. In this state, you can execute calibration procedures without having any instruments connected to the computer.

Selecting a Procedure

The next task is to select the appropriate procedure to run from a list of procedures available. MET/CAL provides several ways to accomplish this. You may search through a list of instrument names and find the procedure you want to run, enter an asset number for the UUT which has a corresponding procedure pre-defined in MET/CAL, or rely on a database-generated workload file. In this exercise we will simply select the procedure we want from the available list.

1. From the menu bar, select Calibrate... A list of available calibration procedures will be presented.
2. Find and select Fluke 87:DEMONSTRATION PROCEDURE. With this procedure name highlighted, click on the OK button.

At this point, the procedure will load and begin running.

The Pre-Calibration Form

Before you actually start calibrating your Fluke 87, MET/CAL prompts you, the operator, for some information. This is done by presenting the pre-calibration form on the computer screen. Data entered here is stored away for use in the final test results and can be printed on the calibration report after the calibration is complete.

1. Type data in your form to match the example in Figure 3. Be sure to advance between fields by using the Tab key. Store information and continue running the procedure by clicking on the OK button.

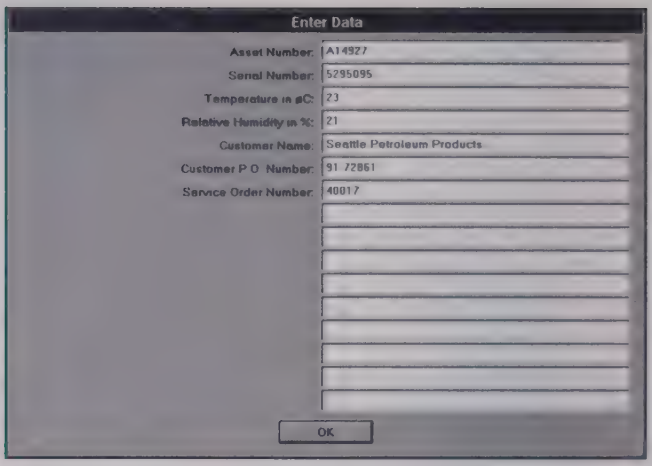


Figure 3. Pre-calibration form.

Feature: *The system administrator can customize this screen and also the corresponding post calibration forms to hold as much or as little information as your shop needs. Up to 16 different variables can be recorded in each form.*

Also, whatever you enter into this screen, either by typing or importing from a file, can be the default value for the next calibration. Therefore parameters which don't change very often, like temperature or humidity, need not be retyped for every calibration event.

CALIBRATING A UUT

Initial Checks and Test Setup

The next thing you will see is a Test Information dialog presenting a warning to the operator. The procedure writer has the ability to present messages and warnings at any point during procedure execution.

1. Click on Advance to go to the next step in the procedure

An enhanced picture of the Fluke 87 DMM's display is now presented, with instructions for the operator to f)llow. This step helps you check that all of the LCD readout segments are operating properly. As an operator, you simply compare the image with the test instrument's LCD – you never have to have seen a Fluke 87 before to know what it is supposed to look like when operational.

2. Click on YES to indicate that all display segments appeared.

Feature: *MET/CAL's graphics display feature allows any number of graphic aids to be used in a calibration procedure. The graphic images are standard Windows bit map files (.bmp) which can be created and edited using the paint program supplied with MS Windows.*

Operator Modes and Test Options

There are three operating modes and seven post-test options you can use during a calibration. Operating modes determine how you will input data into MET/CAL during each calibration step. Post-test options determine how MET/CAL will proceed after each test step is completed. All are optional. The procedure writer has the ability to include or restrict access when the procedure is written. In the following exercises, the procedure has been written to enable the three operating modes successively to provide a demonstration of this capability. In a real procedure, the procedure writer would select the best mode for a given series of tests and only change to a different mode when the situation warranted it.

Go/No-Go Mode. The purpose of this mode is to allow you to perform tests quickly when you do not care about the actual numerical results. You can simply ask the operator if the UUT is indicating a value between the upper and lower limits of the test. Obviously MET/CAL cannot report UUT-indicated values or compute the test error as a percent of tolerance when operating in this mode. Only pass/fail (Go/No-Go) results are available.

To demonstrate this mode, let's proceed with the demonstration procedure from where we left off. You should see an operator message to turn off the Fluke 87.

1. Click on the Advance button. The procedure advances to AC Voltage Tests. A graphic display is presented depicting the connections which should be made between the 5500A calibrator and the UUT.
2. Click on Advance to continue the procedure.
3. After you read the message presented in the Test Information dialog box telling you to select AC volts range on the UUT, click on Advance again.

Look at the Test Evaluation window. Yes and No are two halves of the go/no-go mode. At this point, the calibrator would be providing a source of 350 mV at 60 Hz. If the UUT indicates between 347.2 mV and 352.9 mV, then you would select Yes; if not, you select No.

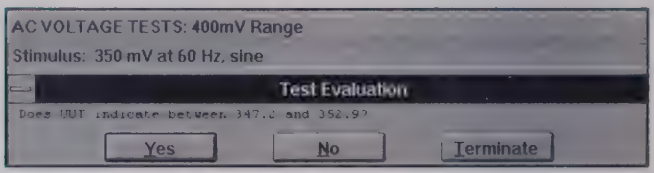


Figure 4. Test Evaluation window in Go/No Go operating mode.

4. Click on Yes, to indicate this test has passed. MET/CAL will record your response and proceed to the next test step.

Slew Mode. Slew mode provides a means of adjusting the calibrator output to obtain an exact reading on the UUT. When a slew type of evaluation is performed, the operator may adjust the output of the calibrator by incrementing or decrementing the digits displayed on the slew window. The UP and DN buttons are provided to make adjustments to the highlighted decade. By using the mouse to click on the < or > buttons the decade to be adjusted can be selected. This gives MET/CAL more information to work with than the Go No Go mode. Actual UUT indicated can be reported and errors from the nominal value can be calculated.

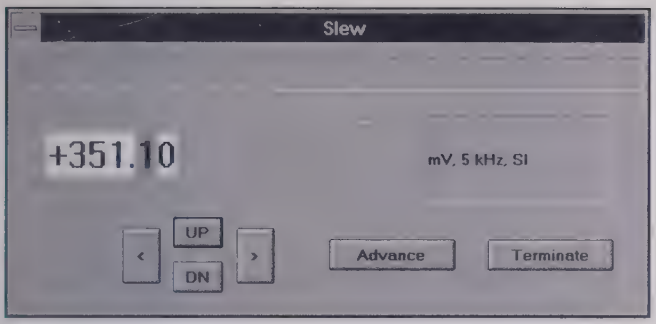


Figure 5. Slew window in Slew operating mode.

5. At this test step, the calibrator would be providing an output of 350 mV at 5 kHz. Click on the UP, DN < > buttons to display an output of +351.10 mV. Click on the Advance button when finished. Again, MET/CAL will record your response and continue on.

Feature: *Slew mode can also be used with calibrator functions which cannot be changed, as in resistance with the 5700A. Since the 5700A uses fixed resistors, minor adjustments cannot be made. In this case, the operator would adjust the value displayed on the screen until it corresponds to the value displayed on the UUT. MET/CAL can then calculate the error from nominal.*

Keyboard Mode. With keyboard entry, you will be typing in the value you see on the UUT's display. Just as in slew mode, MET/CAL will have enough information to compute and report the percent of deviation from the nominal value.

You should now be seeing an operator prompt dialog box on the screen waiting for you to type in the value you see on the UUT. MET/CAL would be programming the calibrator output for 350 mV at 20 kHz.

6. Using the keyboard, type in the value **350** and click on Advance.

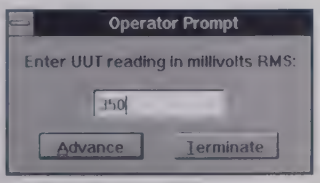


Figure 6. Operator prompt in keyboard operating mode.

You should now be looking at the Post Test Summary Screen. The demonstration procedure has been set up at this point to present the Post-Test Summary screen after every test. The presentation of this screen and the operator options it provides are under the control of the procedure writer. He can turn these options on or off within the procedure itself. Let's examine this screen for a minute.

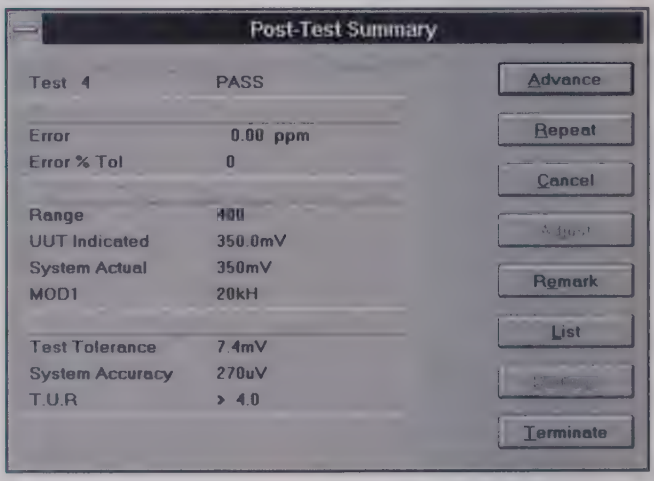


Figure 7. Post-Test Summary screen.

Whenever the Post-Test Summary screen appears, it contains the following information.

TEST
This is the test step number. You just ran test 4.

In the same block with the test number, you will see the result of the test you just ran. The test result can be categorized in the following ways:

PASS or **FAIL**. Over 100% of allowable tolerance produces a failure (optionally, MET/CAL can be set up to indicate 100% of tolerance and above as a failure).

FAIL NOTIFY USER. This message appears if the test result is "significantly out of tolerance." The point at which this occurs may be set by the system administrator. The default is 100% of tolerance and above.

MARGINAL PASS. A marginal pass means that although the test did not fail, it passed with a sufficiently high percent of tolerance that you may want to adjust the UUT to be closer to nominal.

ERROR
This shows the amount of error that the UUT indicated as a % deviation from the nominal value.

ERROR % TOL
This is the error as a percentage of the allowable tolerance. Anything over 70% and up to 100% generates a "MARGINAL PASS."

RANGE
If appropriate, this field indicates the UUT range being tested.

UUT INDICATED
This field displays the value that the UUT was indicating for this test.

SYSTEM ACTUAL
This is the stimulus value of the calibrator.

MOD 1
This space is used to report secondary parameters of the test. In this case, the frequency of the stimulus is reported.

TEST TOLERANCE
This field shows the allowable deviation from nominal in actual test units.

SYSTEM ACCURACY
This is the maximum specified deviation from nominal of the calibrator being used for the test.

T.U.R.
This field displays the Test Uncertainty Ratio (TUR). This is a calculated ratio of the Test Tolerance to System Tolerance. If the TUR is less than 4:1, the actual TUR is displayed; otherwise > 4.0 shows.

Post-Test Summary Operator Options

The buttons presented along the right side of the Post-Test Summary screen represent the options available to the operator for proceeding with the test. See Figure 7.

Repeat Test Option

This option allows the test just completed to be repeated. The results from the previous test execution will be saved and printed in the final test report.

1. Use the mouse and click on the Repeat button.
2. Using the keyboard, type in the value **356** and click on Advance.

Notice that the post test summary screen is presented again, only this time, the result of the test is MARGINAL PASS. MET/CAL provides this test result indication to alert the operator that although the test passed, it did so at a high percent of allowable tolerance. The UUT may require adjustment to bring the result closer to the nominal value. The level of error required to trigger a MARGINAL PASS indication can be set within the calibration procedure itself. MET/CAL will assign a level of 70% of allowable tolerance by default. The UUT value of 356 mV you entered falls above this 70% level and the test result becomes MARGINAL PASS.

Cancel Test Option

This option is similar to Repeat except that the results obtained from the previous execution of this test step are not saved and will not be reported in the final test report. Because Cancel does eliminate the test result from the final calibration report, it is especially useful for when you have made a mistake that caused an out-of-tolerance result for an otherwise in-tolerance test.

3. Use the mouse to click on the Cancel button.
4. Using the keyboard, type in the value **358** and click on Advance.

The post test summary screen now indicates that the reading you just entered, 358 mV, is out of tolerance and shows that the test has failed.

Remark Option
The Remark option allows the operator to insert text to describe observations about the test step just completed. These remarks can be printed in the final calibration report.

5. Use the mouse to click on the Remark button.
6. Type **Reading is erratic.**
7. Click on Advance to continue.

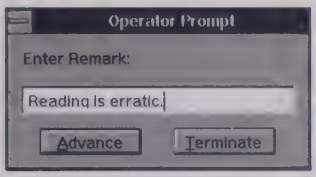


Figure 8. Remark Option.

List Option
The List option presents a view of the currently running procedure listing. The line which will execute next when the operator continues the test is highlighted. The operator is allowed to scroll the highlight bar through all of the test steps and resume test execution at any point in the procedure.

8. Use the mouse to click on the List button.
9. Using the keyboard arrow keys, scroll the highlight bar down to test no. 8.001, the DC Millivolt tests.
10. Click on the Advance button.
11. Click on Advance again after reading the test information to set the UUT to the mVDC function.
12. Using the keyboard, type in the value **358** and click on Advance.

Feature: *Using the List option in conjunction with the Terminate option (below) allows you to do limited calibrations and quick-check devices in your shop for repair.*

Adjust Option
The Adjust option will be enabled if there are adjustment steps available in the procedure and the UUT indicated exceeds the adjustment threshold assigned in the procedure header. Most procedures no longer use embedded adjustment steps. It is usually better to provide a separate adjustment procedure for the UUT which can be executed independently if needed. This preserves the integrity of the "As Found" test results provided by the verification procedure.

This same verification procedure can be run a second time, after any adjustments, to provide "As Left" Test results.

Feature: *MET/CAL provides a special report which can combine "As Found" and "As Left" results into one printout.*

Settings Option

The Settings option is enabled if the procedure contains extensive setup instructions. It provides the operator with a list of all of the settings required for the test. This option is particularly useful when running oscilloscope procedures in which there can be many manual settings to the UUT. If a failure has occurred, the operator can review each of the manual settings (i.e. Time Base, Trigger Level and Plug-In setups) to be sure the UUT is properly configured for the current test.

Terminate Option

The Terminate option halts execution of the procedure and MET/CAL commences the post calibration sequences. We'll look at this sequence of operations in more detail a little later.

13. Click on the Advance button.

Test Results

While running the demonstration procedure up to this point, you may have noticed the Test Results icon in the lower right corner of the main Run Time screen.

14. Double-click on the **Test Results** icon.

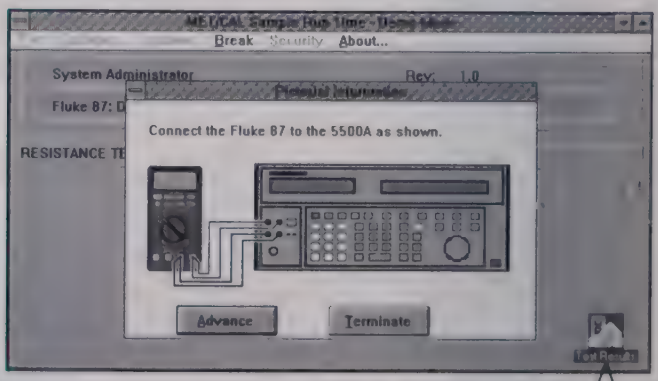


Figure 9. Test Results icon.

This window shows all of the test results recorded for the current procedure. If you have followed this demonstration exactly, you will notice that test 4 is shown in three different colors. You may need to scroll to see all of the test results. Remember that test 4 was repeated twice which yields 3 raw results. The colors designate the outcome of the test.

Color	Meaning
Green	Pass
Red	Fail
Yellow	Marginal Pass

The test results window may be moved to any convenient location on your screen. It will update continuously as additional tests are performed.

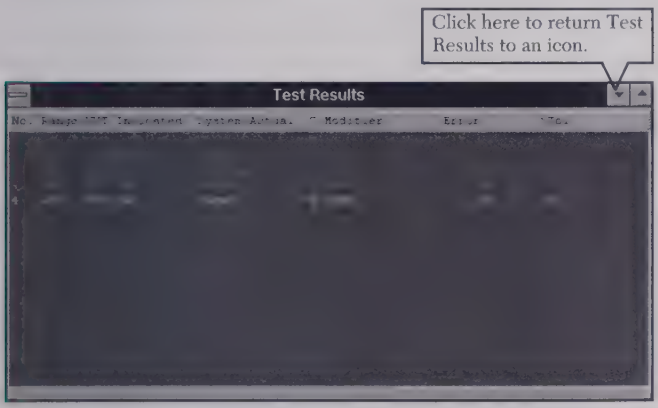


Figure 10. Test Results window.

15. Click on the minimize arrow button to expose the Run Time window again.
16. Click on Terminate in the Operator Prompt window.

You have just told MET/CAL that you do not want to continue executing this test step. MET/CAL will present a special post test dialog so that you can choose how the procedure should proceed.

17. Click on the Terminate dialog box option.

Since we have chosen to terminate the procedure, MET/CAL will shut down all calibration instruments under its control and remind you to remove all connections to the UUT.

18. Click on the OK button.

Finishing Up

After you have finished running a calibration, you are ready to document the results.

POST-CALIBRATION FORM

Like the pre-calibration form, the post-calibration form can be customized to include as much or as little data as you need. There are actually two post-calibration forms available, one which is presented after a Passed calibration and another presented after a Failed calibration. You can specify the data you want included in either of these two forms.

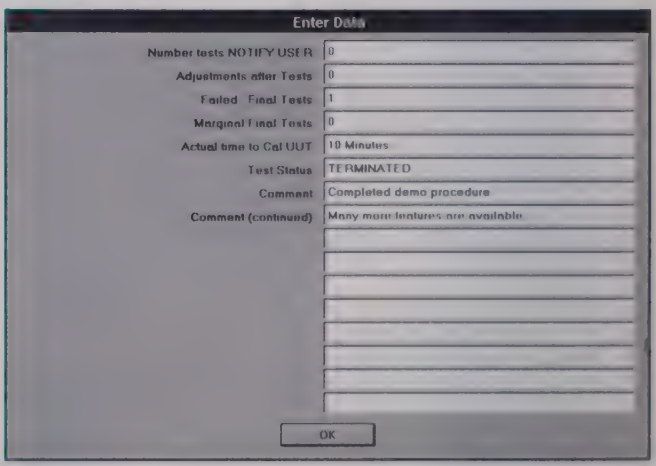


Figure 11. Post-calibration form.

1. Click on the OK button.

POST-CALIBRATION RESULTS DATA

Once you have finished running the procedure, several things can be done with the results. The Post Run Results dialog provides a way for you to choose how you want to save the calibration data.

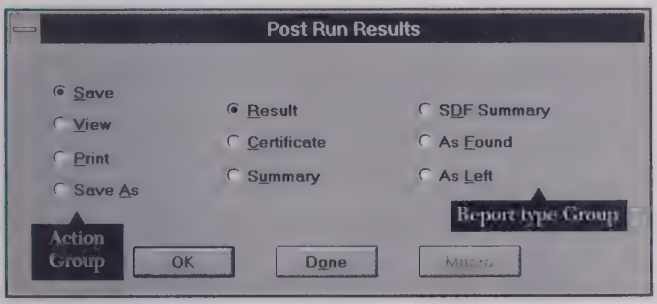


Figure 12. Post Run Results dialog.

The Post Run dialog screen contains two groups of options for selecting the type of report you need and then choosing an action for that report. Let's look at the types of reports available, what they're for and what actions are valid for each.

Report Type	Usage	Valid Actions
Result	A detailed test-by-test listing of the calibration results. The content and format are controlled by a format file you can customize.	Save, View, Print, Save As
Certificate	A "Certificate of Calibration" for the UUT. Format and text are customizable to suit your needs.	Save, View, Print, Save As
Summary	Includes only a summary of the completed calibration event providing UUT information, conditions during the test and final pass/fail information.	Save, View, Print, Save As
SDF Summary	Stores summary information about the calibration event in SDF (comma delimited format) for later importation into an asset management package like Fluke's MET/TRACK.	Save only

Report Type	Usage	Valid Actions
As Found	Same as standard Result above except tagged with an as-found designator.	Save only. Later combined with As-Left to produce a special report of merged results.
As-Left	Same as standard Result above except tagged with an as-left designator.	Save only

A series of these reports can be predefined by the system administrator into a macro instruction which will be executed when the operator clicks on the MACRO button.

Feature: *The system administrator can determine which of the Post Run Results selections are enabled for the operator. In addition, recording results can be programmed to occur automatically, out of the operator's control.*

Viewing Final Results

1. Select View from the action group.
2. Select Result from the report type group.
3. Click on the OK button.

After a few seconds, the results report will be displayed in a window. You can scroll through the text by using the scroll bar on the right side. If you printed this report, it would look exactly like what you see on the screen. As you look through the report you will notice several things:

- The traceability information block lists all of the standards used in this calibration. Each standard listing includes a description, asset number, when it was last calibrated and when it's due for calibration again.
- Any final comments added in the post-calibration prompt screen are included.
- Test number 4, the 350 mV at 20 kHz test appears twice. If you remember, we ran that test three times. The first time it passed, the second was a marginal pass and we chose to Cancel (repeat without saving the previous result), and the

third time we selected Repeat. Then we added our operator comment. The report shows the test result from the first and third times we executed and then prints the comment we added.

- Test 4 also includes your post test remark "Reading is erratic."
- There are no more results because the test was terminated before running to completion.

4. Close the View Result window by clicking the Close box in the upper left window corner and selecting Close.

Saving Results

1. Choose Save from the action group, Result from the report type group and click on the OK button.
2. Click on the Done button.
3. Close the Run-Time module by selecting Exit from the File menu.

VIEW OR PRINT SAVED RESULTS

MET/CAL's Browser module provides view and print access into saved calibration data and procedures. Since the Browser does not allow modification of any data, no login or password is required.

Starting the Browser Module

1. From the MET/CAL Sample program group, double-click on the Browser icon.
2. Click on the File option on the menu bar.
3. Click on Open to display the second cascading menu.
4. Select Result...

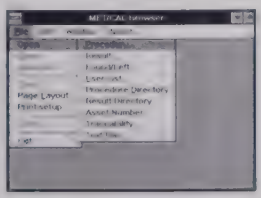
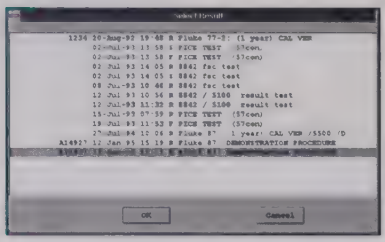


Figure 13. Cascading menu in the MET/CAL Browser.

A catalog of all of the results saved under MET/CAL is presented on the screen. The code letter between the time and UUT name identifies the type of report .



Results Type Code	
Letter	Type
R	Results
S	Summary
C	Certificate
F	Found
L	Left

Figure 14. Results screen.

5. From the list of results dialog, choose Fluke 87: DEMONSTRATION PROCEDURE and click on the OK button.

The test results we just created and saved will be presented in a window for your examination. MET/CAL formats your report by using a template file which you can customize.

6. You may now print this report by selecting File, Print from the menu bar.

7. Close the Browser by selecting Exit from the File menu.

Other Files

In additional to Results, the Browser module can let you view and print other MET/CAL reports and configuration files:

Procedure
MET/CAL procedures available to the Run Time module.

Results
All test results saved after running a MET/CAL procedure.

Found/Left
Special report to merge test result data from consecutive runs of a MET/CAL verification procedure into one report. The first run results are tagged with an As Found flag and the second run results (generally after adjustments are performed) are tagged with an As Left flag.

User List
Lists all of the known users of the MET/CAL system and their assigned access (security) level.

Procedure Directory
A list of all procedures available to MET/CAL.

Result Directory
A list of all results stored from running MET/CAL procedures.

Asset Number
A list of associations between asset number of UUT's and the procedure to run when the asset is selected at Run Time.

Traceability
A list of the standards configured for the workstation.

Text File
Any text file available to your system.

SUMMARY

If you wish to see more of the features MET/CAL can provide, you may open the Run Time module again and run the following three demo procedures:

Fluke 45:DMM (Overview of MET/CAL's Flexibility)

Tektronix 2245:Calibration Pictures (Demo)

Starrett 0-1 Inch:Micrometer 0-1 Inch (Demo)

In this section, you have run the MET/CAL Sample Version and learned how to select and start a calibration procedure. You have seen how easy it is to move around the program, select options and enter data. You've also run a partial calibration, and through its features seen evidence of the power and flexibility that MET/CAL can give you.

MET/CAL frees you from having to worry about all the administrative tasks that have always prevented you from getting more work done. With MET/CAL, your reports and certificates are saved and generated automatically. The procedures are sensible and easy to follow. And your time is even tracked for you so you don't have to worry about detailing each minute you spent on this or that instrument. You have more time to do what you do best: calibrate.

ADMINISTRATOR OPTIONS

The Administrator module is designed to set up the operation of MET/CAL for your particular installation. The following general capabilities are provided:

- Define operating options in the MET/CAL installation.
- Manage Procedure and Result files.
- Configure and maintain workstation standards installed in the system.
- Set up and maintain allowed users.

Because the integrity of your system is of the utmost importance, access to the Administrator module is restricted to the system administrator. The only exception to this is that a procedure writer can use the Administrator module to copy and hide procedures, copy results and set both default and display fonts. No critical files can be accessed except by the authorized system administrator. The SA is initially assigned when MET/CAL is first installed. Additional users can be given SA privileges by editing users in the Administrator module.

1. Start the Administrator module by double clicking on the Administrator icon.

2. Log into the Administrator by typing **fluke** for User Name and **ok** for password and click on the OK button.

CREATING MACROS

In MET/CAL, macros are used to automate the storage and printing of test results at the end of every calibration event. Macros provide two important benefits. First, the PostRun macro will reduce the number of options that the operator must select after a calibration. Second, Autosave macros can be configured to perform Result Save and Print operations automatically without requiring any action by the operator.

PostRun Macro

The PostRun macro combines several Results Save and Print operations into one button selection for the operator. If you routinely need to have the results data saved, then a calibration certificate printed, then a result summary saved for importing to your asset database, the operator would have to make three distinct selections after completing every calibration. A PostRun macro can combine all of these commands into one simple operation for the operator. The operator only needs to click on the Macro button at the end of each test when the Post Run Results dialog box is presented. See Figure 12 on page 23. To set up a macro, proceed as follows:

1. Click on Configure from the Administrator menu bar.
2. Click on PostRun Macro from the pull down submenu. The dialog box presented allows you to select which operations you want to occur when the operator runs the PostRun Macro. In the example on the right, the full test results would be saved, a test summary would be saved and a calibration certificate would be printed.

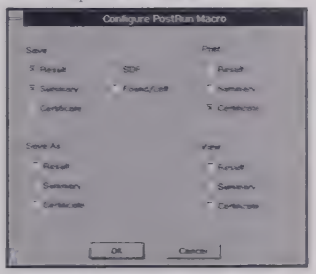


Figure 15. Configure PostRun Macro.

3. Click on the OK button when you are finished making your selections.

Autosave Macros

Autosave macros work just like the PostRun macro except the actions you defined are executed without any action on the part of the operator. There are two Autosave macros, Autosave Pass and Autosave Fail. As the name implies, the Autosave Pass defines the automatic actions which will occur when the UUT passes all of its tests and the Autosave Fail controls what occurs when the UUT fails. To configure an Autosave macro, do the following:

1. Click on Configure from the Administrator menu bar.

2. Click on Autosave Pass or Autosave Fail from the pull down submenu. The dialog box presented offers the same options as the PostRun macro.
3. Click on the OK button when you are finished making your selections.

PostRun Dialog

As the system administrator, you can limit the save and print options presented to the operator after each calibration event. In fact, you must specifically enable each of the PostRun dialog options. If you do not enable at least one of the possible choices, the PostRun dialog box will not be presented at all and you will have to rely on configured Autosave macros to save and print test results. To enable PostRun options, do the following:

1. Click on Configure from the Administrator menu bar.
2. Click on PostRun Dialog from the pull down submenu. A dialog box is presented to allow you to enable or disable the options to be available to the operator. Clicking on each option toggles the capability. If all of the options are turned off, then the PostRun Results dialog will not appear at the end of a procedure.

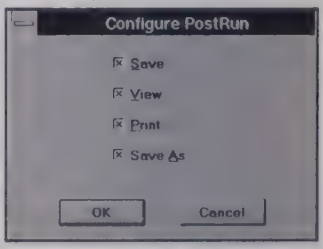


Figure 16. Configure PostRun Dialog.

3. Click on the OK button when you are finished making your selections.
4. Close the Administrator module by selecting Exit from the File menu.

CREATING CALIBRATION PROCEDURES

Along with well-trained technicians, the calibration procedure has always been the center of a well-designed calibration operation. Procedures, once tested, are your assurance the term "certified" means the same thing every time an instrument is calibrated.

So it is with MET/CAL; the core of its power is the consistency of its calibrations. That means well written, tested procedures. To support the wide range of functions required of a procedure writer, MET/CAL provides a full-featured procedure editor module.

EDITOR ESSENTIALS

Before you start working with procedures, you need to learn some of the essentials of procedure editing:

- Running the editor
- Loading and saving files
- Using on-line help

Running the Procedure Editor

In order to run the procedure editor, you must have either procedure writer or administrator access assigned to your login name. In this sample version, the appropriate access level has been set up for you.

1. Start the Editor module by double-clicking on the Editor icon.
2. Log into the MET/CAL Editor module by typing **fluke** for the user name and **ok** for the password and click on the OK button.

About MET/CAL Procedures

A MET/CAL procedure is a data file containing instructions for how the MET/CAL system should conduct a series of test steps. The instrument being calibrated is usually referred to as the Unit Under Test (UUT).

MET/CAL procedures are written in a special language which is able to satisfy the needs of humans who must be able to write, read and evaluate procedures and the requirements of the computer which needs detailed instructions to operate the calibration system. To accomplish this, MET/CAL uses procedure statements comprised of Function Select Codes (FSCs). As you'll see, FSCs are powerful commands which simplify the job of writing automated procedures.

CREATING A PROCEDURE

When you want to create a new procedure, MET/CAL makes it easy for you. If the item you want to add is very similar to an existing device for which a procedure already exists, you can modify a copy of the existing procedure. Then save this modified file as a new procedure. If you must write your own complete procedure, it's easy if you obtain a manual for the new UUT with specifications.

Feature: *MET/CAL provides hundreds of pre-written procedures for a wide variety of UUTs. You'll likely find a tested procedure for most of the instruments in your workload. You must, however, "proof" the procedure to be sure that it supports your lab's calibration philosophy. With a little practice, you will be able to read and modify any MET/CAL procedure to suit your specific needs.*

In this exercise, we will create a new procedure for a Fluke Model 8 and a Fluke Model 10. If you look at the instruction manuals for these instruments, you will find that they are almost identical so we'll take advantage of MET/CAL's ability to assign multiple names to procedures. This means that we can create one procedure to verify both meter types. In this exercise, we will assume that you don't have access to any pre-written procedures and must create one from scratch. To

save time, we will also only write a partial test program, enough to give you the basic procedure writing concepts. A complete, tested procedure for Fluke's 8 and 10 series is provided with MET CAL's included procedures. If you look at the Series 10 Service Manual, you will find a table of specifications and a table defining the performance tests you need to run. The procedure we're about to write is based on those tables.

Creating a Working File

1. Log into the MET CAL Editor module if you haven't already done so. Then click on File from the menu bar and select New.

   A blank editing window appears. This is your workspace for creating a new procedure. The first thing we'll do is name this procedure.

2. Type Ctrl -I

   By typing Ctrl -I, you are telling the editor that you want to name the procedure. MET CAL responds by inserting - INSTRUMENT: - on the line. Procedure names are almost always based on the instrument you are writing the procedure for.

3. Type the following:
   Fluke 8: (1 year) CAL VER /DEMO ↵ Enter .

   When you press the ↵ Enter key above, MET CAL assigns the text you typed in as the procedure name. But procedures can have more than one name. Since we have already determined that we want to use this new procedure for the Fluke 10 as well as the model 8, we can type in another name.

4. Type Ctrl -I again and type:
   Fluke 10: (1 year) CAL VER /DEMO ↵ Enter

   You can assign up to 6 names for any procedure in this way. These names are presented to the system operator when Calibrate is initiated in the Run Time module. MET CAL will run this procedure when either of its names is selected.

Filling Out the Procedure Header

5. Click on Compile and select Next Error.

   This command causes the Editor's compiler to look at the procedure so far, format all lines and check for proper syntax. If it doesn't already exist, the procedure header is inserted automatically at the top of the procedure. To view the header it may be necessary to use the vertical and horizontal scroll bars to position your view to the top of the file. The remainder of the header information can now be filled in.

6. Using the keyboard and mouse as you would in any Windows-based editor, fill in the AUTHOR and REVISION fields to match the following.

```
MET/CAL Sample                                          MET/CAL Procedure
================================================================================
INSTRUMENT:              Fluke 8:(1 year) CAL VER/DEMO
INSTRUMENT:              Fluke 10:(1 year) CAL VER/DEMO
DATE:                    09-Feb-95
AUTHOR:                  John Smith
REVISION:                1.0
ADJUSTMENT THRESHOLD:    70%
NUMBER OF TESTS:         1
NUMBER OF LINES:         18
================================================================================
 STEP    FSC    RANGE NOMINAL          TOLERANCE      MOD1          MOD2  3  4 CON
```

Figure 17. Procedure header.

The ADJUSTMENT THRESHOLD line represents the percent of allowable tolerance above which you may want to adjust the UUT to bring a reading closer to nominal. MET/CAL is capable of including adjustment steps within the procedure which will be executed only when a test result tolerance is above the adjustment threshold. We will not be including any adjustment steps in this exercise.

Note: Depending on the procedures used in your lab, you may choose to write a separate adjustment procedure. This will preserve the "As Found" test results obtained from running a verification procedure when a UUT is first checked in your lab. If a subsequent adjustment procedure is completed, the verification procedure can be re-run to provide documented "As-Left" data.

Values for all remaining fields in the header section are inserted or revised by MET/CAL each time the procedure is compiled.

Entering Test Steps in the Procedure Body

The body of the procedure is entered just below the header, under the column headings line.

Note: If you want to know more about FSC's and other options available as you are entering test steps, you can get context sensitive help any time by pressing F1. The help you will see is based on the cursor position within the procedure file and the contents of the current line. If you ask for help while the cursor is on a blank line, you will see an overview of procedure topics and FSC's.

Execution Options

To start off our new procedure, we'll enter directives to MET/CAL which control the execution process. These directives are provided by the ASK Function Select Code.

7. Starting on the next blank line below the column headings enter the following two lines:

   ASK- R N P F V ↵Enter

   Be sure to include spaces after the minus sign and between each letter.

   ASK+ K ↵Enter

   These command lines have the following effects:

ASK- R	Disables MET/CAL's automatic range and function change messages.
ASK- N	Disables MET/CAL's automatic messages to set UUT operate modes.
ASK- P	Causes MET/CAL to repeat complete test steps if the operator selects Repeat from a Post Test Dialog.
ASK- F	Disables Post Test summaries.
ASK- V	Disables MET/CAL's automatic connection messages.
ASK+ K	Causes MET/CAL to use keyboard entry.

   Next we'll enter a description of the test section we are about to write. We do this by using the HEAD FSC followed by a text string which contains the description. This FSC will produce a header which displays to the operator when the procedure is run.

8. Enter the following line:

   HEAD EQUIPMENT SETUP ⇦Enter

Displaying Messages

As the header implies, we will now provide setup instructions for the operator. The DISP FSC provides a way to do this. Up to eight lines of text can be displayed in a dialog box to present a single message. When executed, the operator must acknowledge the message by selecting the Advance button to continue the procedure.

9. Enter the following two display lines:

   DISP Move the Slide-Switch to the right position ⇦Enter

   DISP Press SELECT for Ohms ⇦Enter

10. Let's compile what we have entered so far.

    Click on Compile and select Next Error.

    During the compile process, MET/CAL scans through your procedure lines checking for errors and then automatically numbers each line. If everything has been entered correctly so far, your screen should look like the example shown in Figure 18.

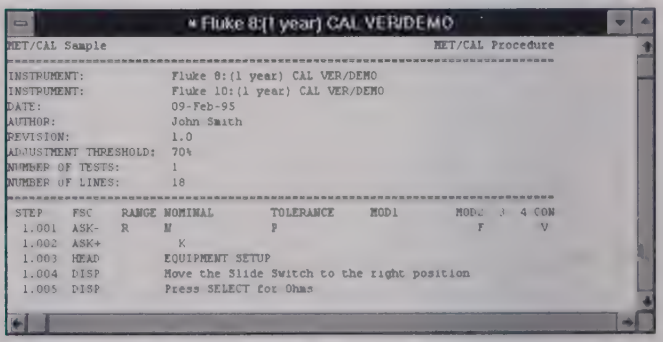

Fluke 8:(1 year) CAL VER/DEMO
MET/CAL Sample
MET/CAL Procedure
INSTRUMENT: Fluke 8:(1 year) CAL VER/DEMO
INSTRUMENT: Fluke 10:(1 year) CAL VER/DEMO
DATE: 09-Feb-95
AUTHOR: John Smith
REVISION: 1.0
ADJUSTMENT THRESHOLD: 70%
NUMBER OF TESTS: 1
NUMBER OF LINES: 18
STEP FSC RANGE NOMINAL TOLERANCE MOD1 MOD2 MOD3 MOD4 CON
1.001 ASK- R N P F V
1.002 ASK+ K
1.003 HEAD EQUIPMENT SETUP
1.004 DISP Move the Slide Switch to the right position
1.005 DISP Press SELECT for Ohms

Figure 18. Writing a MET/CAL procedure.

If you run this procedure the way it is, you will see that the two DISP statements produce two separate message dialogs for the operator. We actually want both lines to appear on only one dialog. To accomplish this, we must tell MET/CAL

that step 1.005 is actually a continuation of the DISP message on step 1.004. The following steps will get this job done:

11. Be sure that the cursor is somewhere on line 1.005.
12. Click on Edit in the menu bar and then click on Continue.
13. Click on Compile and select Next Error.

    You will notice that both DISP lines now have the same line number, 1.004. Both messages will now appear in the same message dialog box for the operator to read and acknowledge.

Displaying Picture Files

We could continue to use the DISP FSC to tell the operator how to make connections between the calibrator and the UUT. We could also use MET/CAL's automatic connection messages. But sometimes a picture offers a better way to show how cables should be connected. MET/CAL allows you to present any bit-mapped picture you can create which conforms to the Windows BMP format. These pictures can be created using the Windows Paint program provided with most normal Windows 3.1 installations. For our demonstration, a picture file has been created for you. The file name is 55_10_cw.bmp.

14. To display this picture file during our procedure execution, enter the following line:

    PIC 55_10_CW ↵ Enter

This completes the initial setup and we can now get on with making measurements and evaluating the UUT's performance.

Resistance and Voltage Tests

We've chosen to perform our verification checks in a slightly different order than they are presented in the manual. The reason for this is to complete all of the checks requiring 4-wire connection first and then finish all of the 2-wire tests. This is a more efficient way to run the tests because the operator will only need to make lead changes once. Therefore we'll start with resistance. Add a HEAD statement to change the header presented to inform the operator we're about to test resistance.

15. Enter the following:

    HEAD RESISTANCE TESTS: {400 Ohm Range} [Enter]

    Note: The text entered within the {} will be printed in the final test report. This will make the report more readable by providing title lines which identify subsequent printed test results.

    Now we're ready to program the calibrator and take a measurement with the UUT. This is accomplished with an Evaluation FSC. The first resistance check provided in the Performance test table is a 0.0 Ohms stimulus with the UUT in the 400 Ohm range. The specification is +(1.5% of reading + 2 counts). To provide the stimulus and make the measurement requires only one line in the procedure. Let's construct that line one segment at a time to show how it operates.

16. First we'll tell MET/CAL which calibrator to use by selecting the 5500 FSC. On the next available procedure line start by typing the following; do not press the [Enter] key yet.

    5500 [Space]

17. Next we'll enter the UUT range for this test.

    400R [Space]

18. Now we'll enter the stimulus (Nominal) value. This will tell the 5500A to output 0.0 Ohms.

    0.0Z [Space]

    The Z of course is our way of telling the 5500A that we want to use the resistance function. Why do we use 0.0 Ohms instead of 0.000 Ohms? Because the resolution used in the nominal value establishes the resolution of the formatted results printout. You will want your final test report to print only the resolution available from the UUT display.

19. Now we want to enter the test tolerance. The tolerance for this UUT has two components. Both tolerance specifiers can be entered on the FSC line and will be added together by MET/CAL. We know from the specification that the tolerance at 0 Ohms is 1.5% of

reading + 2 digits. On the 400 Ohm range, 1 digit on our UUT is equal to 0.1 Ohms. Therefore enter the following:

+1.5% +0.2U Space

The % symbol tells MET/CAL that this portion of the tolerance should be applied to the UUT indicated value. The U in this case stands for units as defined in the nominal field above which in this test is Z for Ohms. The + symbol indicates that these are an asymmetrical test tolerance specifiers and the tolerance is allowed only on the positive side of 0 Ohms (i.e.: -0, +0.2 Ohms). This makes sense since the UUT cannot display negative ohms.

20. Finally enter the type of connection we are using between the UUT and calibrator. In this case, our connection is "Compensated Two Wire" so enter the following:

    CW ↵ Enter.

    Upon pressing the ↵ Enter key, the new line you've just entered is formatted and checked for errors. If an error is detected, it will be presented in a separate error window.

Feature: *MET/CAL Evaluation FSC's are very versatile. There are many options available to handle things like asymmetrical tolerance limits, specifying tolerances as percentage of nominal, percentage of UUT indicated, percentage of range or specifications in PPM. You can easily write tests for most UUT's directly from the specification sheet.*

21. Continue to enter test lines as shown below to complete the 400 Ohm range tests. Note that these test tolerances are entered with no sign which produces a symmetrical tolerance for these tests.

    5500 400R 1.0Z 1.5% 0.2U CW ↵ Enter

    5500 400R 350.0Z 1.5% 0.2U CW ↵ Enter

22. Now let's go ahead and enter the remaining test steps. We'll insert a HEAD FSC between each function and range to identify each test segment. For each test, we

are following the Performance Test Table in the instruction manual and applying the instrument specifications as written.

Complete the remaining test entries as follows:

HEAD RESISTANCE TESTS: {4 kOhm Range} Enter

5500 4R 1.000kZ 1.5% 0.001U cw Enter

HEAD RESISTANCE TESTS: {40 kOhm Range} Enter

5500 40R 35.00kZ 1.5% 0.01U cw Enter

HEAD RESISTANCE TESTS: {400 kOhm Range} Enter

5500 400R 100.0kZ 1.5% 0.1U cw Enter

HEAD RESISTANCE TESTS: {4 MOhm Range} Enter

23. The remaining tests will require only a 2-wire connection between the UUT and the calibrator. We'll use a picture to prompt the operator to make the connection change.

    PIC 55_10_2W Enter

    5500 4R 2.900MZ 1.5% .001U 2W Enter

    HEAD RESISTANCE TESTS: {4 MOhm Range} Enter

    5500 40R 35.00MZ 1.9% .03U 2W Enter

24. Next we'll move on to the AC voltage tests.

    HEAD {AC VOLTAGE TESTS} Enter

    DISP Move the Slide-Switch to the center position. Enter

    DISP Enter

    DISP Press SELECT for VAC. Enter

25. We want the three DISP statements above to appear in one dialog box for the operator. Just as we did before, place the cursor on the second and third DISP lines and mark them as continuation lines by doing the following for each:

    Click on Edit in the menu bar and then click on Continue.

26. When both DISP lines are tagged as continuation lines, compile the procedure to verify that MET/CAL assigns the same test step number for all three lines.

27. The next few lines will program the 5500A to output an AC voltage and make an evaluation. To do this, the nominal value includes a V to indicate volts, 50H is added to the line to indicate the output should be 50 Hz, and since we want the source to be a sine wave, SI is also added to the FSC line.

    HEAD AC VOLTAGE TESTS: (4V Range) Enter

    5500 4R 0.010V 2.9% 0.003U 50H SI 2W Enter

    Now the same test performed at 400 Hz.

    5500 4R 0.010V 2.9% 0.003U 400H SI 2W Enter

    Increment the 5500A output to the next test voltage and evaluate the UUT at 50 Hz and 400 Hz.

    5500 4R 3.500V 2.9% 0.003U 50H SI 2W Enter

    5500 4R 3.500V 2.9% 0.003U 400H SI 2W Enter

    Additional ranges can be tested in the same way.

    HEAD AC VOLTAGE TESTS: (40V Range) Enter

    5500 40R 35.00V 2.9% 0.03U 50H SI 2W Enter

    5500 40R 35.00V 2.9% 0.03U 400H SI 2W Enter

    The 400V and 600V range tests have been omitted.

28. Now let's move on to the DC voltage tests.

    HEAD (DC VOLTAGE TESTS) Enter

    DISP Press SELECT for VDC. Enter

    HEAD DC VOLTAGE TESTS: (4V Range) Enter

    DISP Press RANGE to select the 4V Range. Enter

29. Using the 5500 FSC to program DC volts is simple. Just as before, enter the FSC name, range of the UUT, the desired output value, the UUT tolerance specifiers and the connection type. Since we are not specifying a frequency or waveform type, DC is understood.

    5500 4R 0.000V 1.5% 0.002U 2W Enter

    HEAD DC VOLTAGE TESTS: (40V Range) Enter

    DISP Press RANGE to select the 40V Range. Enter

    5500 40R 0.02V 1.5% 0.01U 2W Enter

That's it! Additional steps are still required to complete all of the UUT's ranges and functions but the programming concepts are the same.

30. Our abbreviated procedure is now ready for final compilation and testing. Compile now by:

    Click on Compile in the menu bar and then click on Next Error.

    If all is well you will see a message on the bottom of the screen informing you that there are no errors and that your procedure is executable. If there are errors, they will be displayed in the "ERROR MESSAGES" window.

Saving Your Procedure

31. Now is a good time to save your work. To write your new procedure to disk do the following:

    Click on File.

    Select Save Procedure from the drop down menu.

    Your work will be stored on the hard disk and MET/CAL will record the text you typed in the header on the Instrument lines as names for this procedure.

Checking for Adequacy - TUR Report

Now that you have an executable procedure, you may want to document that the standards used are adequate for the job. MET/CAL provides the TUR Report for this purpose. Producing a TUR report will copy your procedure to a new window where MET/CAL will scan each evaluation line and produce a corresponding comment line which contains Test Uncertainty Information about the test.

32. To produce a TUR report, do the following:

    Click on Compile.

    Select T.U.R. Report from the drop down menu.

    A new document window will open displaying a TUR report for your procedure. As you scan through it, notice that each evaluation line has a comment line (comment lines begin with #) under it. If your procedure is

entered correctly, then all Test Uncertainty Ratios will be greater than 4:1. This means that in all tests, the 5500A is at least 4 times more accurate then the UUT.

33. Close the TUR report by clicking the Close box and selecting Close.

Testing the Procedure

The MET/CAL editor includes a test run facility to quickly test a new or modified procedure. You could use the Run Time module for this but that would be less convenient. Test Run will operate your new procedure in either "Live" (with standards and UUT operating) or in "Demo" modes. It will not, however, produce any test results. Test Run is provided to assist you in developing procedures where you may wish to execute segments of a procedure to see how they operate and then cycle back to do additional editing. Your procedure must be successfully compiled before Test Run can execute it.

To use Test Run, do the following:

1. Click on Test Run from the menu bar.
2. Select Restart from the drop down menu.
3. Select Run from the Test Run Menu.
4. When you're finished, select Quit from the Test Run Menu.

   The above steps will start procedure execution from the top. There may be times when you want to rerun segments further into a procedure. In this case, you should run the procedure once from the top to establish the necessary system setup conditions (like ASK flags). Then you can position the cursor anywhere in the procedure and begin execution from that point.

If you want to try this out do the following.

1. Click on Test Run from the menu bar.
2. Select Go from the drop down menu.
3. When you're finished, select Quit from the Test Run menu.
4. Exit the MET/CAL Editor by selecting Exit from the File menu.

NOTES

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